Operating Systems Laboratory

Lab 3

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Part 1

We studied the behaviour of the Minix scheduler with the use of the Unix Benchmark Suite. Modifying the given `workload_mix`, we created a few custom workload mixes to study the scheduler's behaviour. Each workload contains a different set of benchmarks ranging from all compute-intensive benchmarks to all I/O-intensive benchmarks helping us understand how the scheduler works.

workload_mix1.sh:

The workload is as follows:

```
#!/bin/sh
./hanoi.sh &
./hanoi.sh &
./hanoi.sh &
./hanoi.sh &
./hanoi.sh &
wait
```

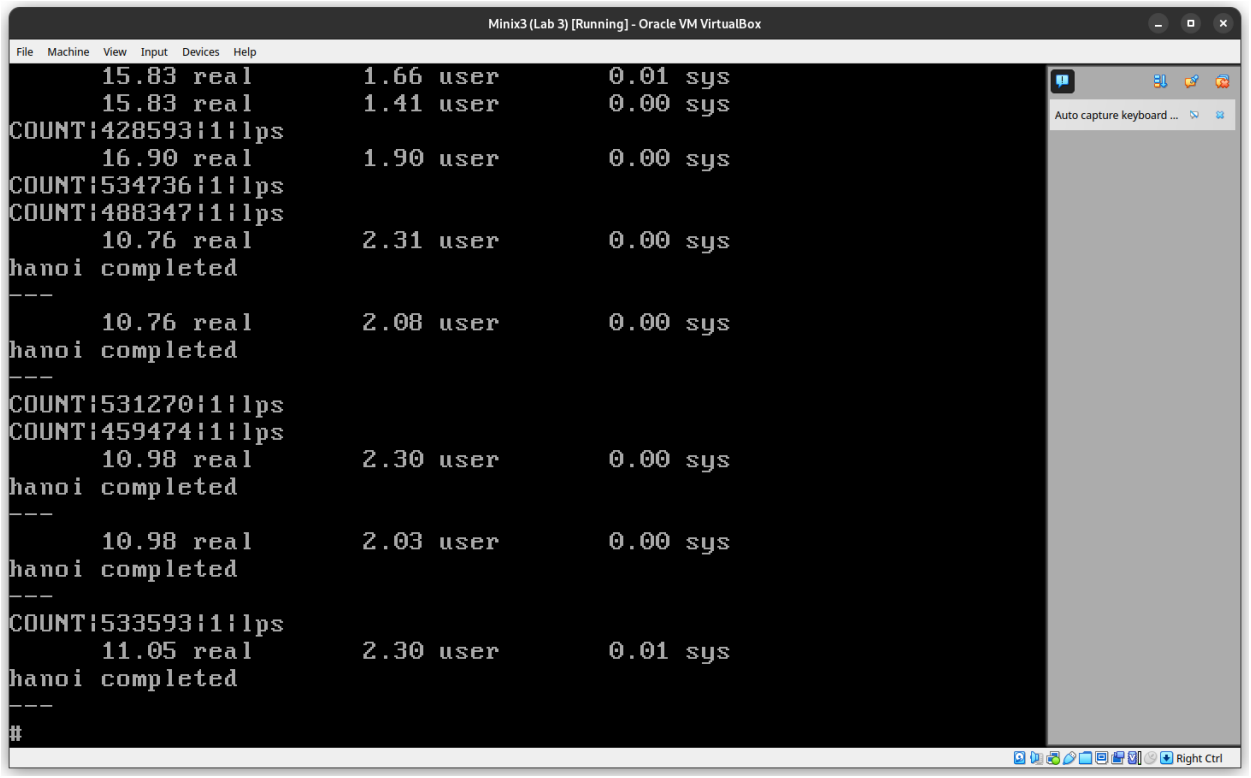
In this workload, we run 5 `hanoi` processes simultaneously. The `hanoi` processes are CPU-bound processes, which have equal priority, and hence the two processes are allotted time slots in an round robin fashion by the scheduler, which can be seen in the messages below.

The job is allotted 200 quantums out of which it completes the total time as it is a CPU-bound job which completes its entire quanta.

```
Minix (200010036): PID 712 created (Endpoint: 15)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 15)
Minix (200010036): PID 713 created (Endpoint: 18)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 18)
Minix (200010036): PID 714 created (Endpoint: 33)
```

```
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 33)
Minix (200010036): PID 715 created (Endpoint: 35)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 35)
Minix (200010036): PID 716 created (Endpoint: 36)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 36)
Minix (200010036): PID 717 created (Endpoint: 37)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 37)
Minix (200010036): PID 718 created (Endpoint: 38)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 38)
Minix (200010036): PID 719 created (Endpoint: 39)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 39)
Minix (200010036): PID 720 created (Endpoint: 40)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 40)
Minix (200010036): PID 721 created (Endpoint: 41)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 41)
Minix (200010036): PID 722 created (Endpoint: 42)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 42)
Minix (200010036): PID 723 created (Endpoint: 43)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 43)
Minix (200010036): PID 724 created (Endpoint: 44)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 44)
Minix (200010036): PID 725 created (Endpoint: 45)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 45)
Minix (200010036): PID 726 created (Endpoint: 46)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 46)
Minix (200010036): PID 727 created (Endpoint: 47)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 47)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 24 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 404 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 70 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 61 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 47)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 45)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 46)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 44)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 43)
Minix (200010036): PID 723 exited (Endpoint 43)
Minix (200010036): PID 718 exited (Endpoint 38)
Minix (200010036): PID 713 exited (Endpoint 18)
```

```
Minix (200010036): PID 724 exited (Endpoint 44)
Minix (200010036): PID 719 exited (Endpoint 39)
Minix (200010036): PID 714 exited (Endpoint 33)
Minix (200010036): PID 726 exited (Endpoint 46)
Minix (200010036): PID 721 exited (Endpoint 41)
Minix (200010036): PID 716 exited (Endpoint 36)
Minix (200010036): PID 725 exited (Endpoint 45)
Minix (200010036): PID 720 exited (Endpoint 40)
Minix (200010036): PID 715 exited (Endpoint 35)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036): PID 727 exited (Endpoint 47)
Minix (200010036): PID 722 exited (Endpoint 42)
Minix (200010036): PID 717 exited (Endpoint 37)
Minix (200010036): PID 712 exited (Endpoint 15)
```



workload_mix2.sh:

The workload is as follows:

```
#!/bin/sh
./fstime.sh &
./fstime.sh &
./fstime.sh &
```

```
./fstime.sh &
./fstime.sh &
wait
```

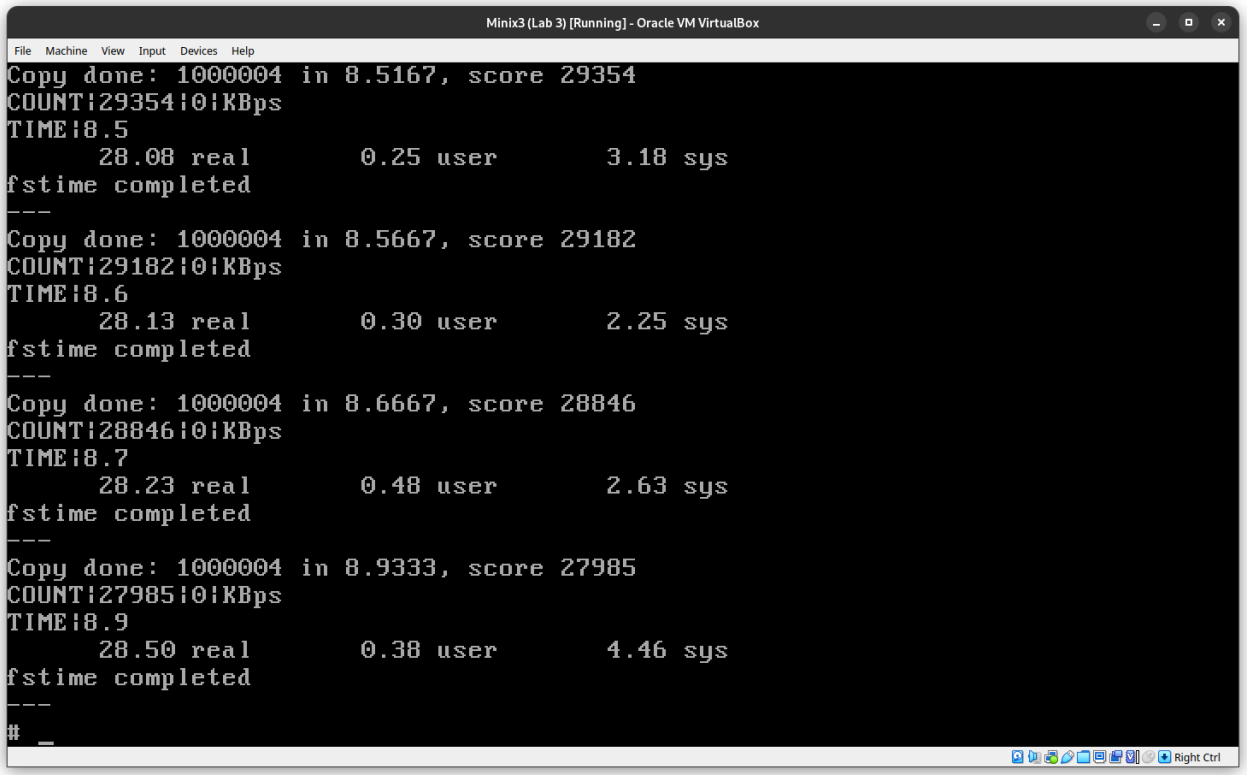
In this workload, we run 5 `fstime` processes simultaneously. The `fstime` processes are IO-bound processes, which have equal priority, and hence the two processes are allotted time slots in an round robin fashion by the scheduler, which can be seen in the messages below. The `fstime` process gets blocked due to IO and once it finishes resumes execution.

The IO job itself is allotted 500 quantums out of which it does not complete the total time as it gets blocked after making the IO call.

```
Minix (200010036): PID 712 created (Endpoint: 15)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 15)
Minix (200010036): PID 713 created (Endpoint: 18)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 18)
Minix (200010036): PID 714 created (Endpoint: 33)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 33)
Minix (200010036): PID 715 created (Endpoint: 35)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 35)
Minix (200010036): PID 716 created (Endpoint: 36)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 36)
Minix (200010036): PID 717 created (Endpoint: 37)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 37)
Minix (200010036): PID 718 created (Endpoint: 38)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 38)
Minix (200010036): PID 719 created (Endpoint: 39)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 39)
Minix (200010036): PID 720 created (Endpoint: 40)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 40)
Minix (200010036): PID 721 created (Endpoint: 41)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 41)
Minix (200010036): PID 722 created (Endpoint: 42)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 42)
Minix (200010036): PID 723 created (Endpoint: 43)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 43)
Minix (200010036): PID 724 created (Endpoint: 44)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 44)
Minix (200010036): PID 725 created (Endpoint: 45)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 45)
Minix (200010036): PID 726 created (Endpoint: 46)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 46)
Minix (200010036): PID 727 created (Endpoint: 47)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 47)
```

```
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 24 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 404 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 70 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 61 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 47)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 45)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 46)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 44)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 43)
Minix (200010036): PID 723 exited (Endpoint 43)
Minix (200010036): PID 718 exited (Endpoint 38)
Minix (200010036): PID 713 exited (Endpoint 18)
Minix (200010036): PID 724 exited (Endpoint 44)
Minix (200010036): PID 719 exited (Endpoint 39)
Minix (200010036): PID 714 exited (Endpoint 33)
Minix (200010036): PID 726 exited (Endpoint 46)
Minix (200010036): PID 721 exited (Endpoint 41)
Minix (200010036): PID 716 exited (Endpoint 36)
Minix (200010036): PID 725 exited (Endpoint 45)
Minix (200010036): PID 720 exited (Endpoint 40)
Minix (200010036): PID 715 exited (Endpoint 35)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036): PID 727 exited (Endpoint 47)
Minix (200010036): PID 722 exited (Endpoint 42)
Minix (200010036): PID 717 exited (Endpoint 37)
```

```
Minix (200010036): PID 712 exited (Endpoint 15)
```



workload_mix3.sh:

The workload is as follows:

```
#!/bin/sh
./arithoh.sh &
./fstime.sh &
./arithoh.sh &
./fstime.sh &
./arithoh.sh &
wait
```

In this workload, we consider CPU bound (arithoh.c) and I/O bound (fstime.c) processes alternately. The arithoh process gets 200 quanta, which is completely used by it. The CPU bound job fstime also gets 200 quanta which is partially used by it, as it gets blocked frequently for I/O. Sometimes the I/O bound process gets blocked for a longer time and gets completed once it is served by the I/O device. Here, each queue uses round robin scheduling mechanism to run the processes in the queue, and hence reduces the response time of the I/O process as they are allotted a time slice very soon after coming out of the blocked state.

```
Minix (200010036): PID 10442 created (Endpoint: 126)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 126)
Minix (200010036): PID 10443 created (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036): PID 10444 created (Endpoint: 128)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 128)
Minix (200010036): PID 10445 created (Endpoint: 129)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 129)
Minix (200010036): PID 10446 created (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036): PID 10447 created (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036): PID 10448 created (Endpoint: 132)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 132)
Minix (200010036): PID 10449 created (Endpoint: 133)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 133)
Minix (200010036): PID 10450 created (Endpoint: 134)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 134)
Minix (200010036): PID 10451 created (Endpoint: 135)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 135)
Minix (200010036): PID 10452 created (Endpoint: 136)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 136)
Minix (200010036): PID 10453 created (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036): PID 10454 created (Endpoint: 138)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 138)
Minix (200010036): PID 10455 created (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036): PID 10456 created (Endpoint: 140)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 140)
Minix (200010036): PID 10457 created (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 101 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 147 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 150 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 141)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 162 / 200 quantum used (Endpoint: 139)
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```
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 140)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 138)
Minix (200010036): PID 10454 exited (Endpoint 138)
Minix (200010036): PID 10449 exited (Endpoint 133)
Minix (200010036): PID 10444 exited (Endpoint 128)
Minix (200010036): PID 10456 exited (Endpoint 140)
Minix (200010036): PID 10451 exited (Endpoint 135)
Minix (200010036): PID 10446 exited (Endpoint 130)
Minix (200010036/37): 280 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 151 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 1 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 120 / 200 quantum used (Endpoint: 137)
```

```
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
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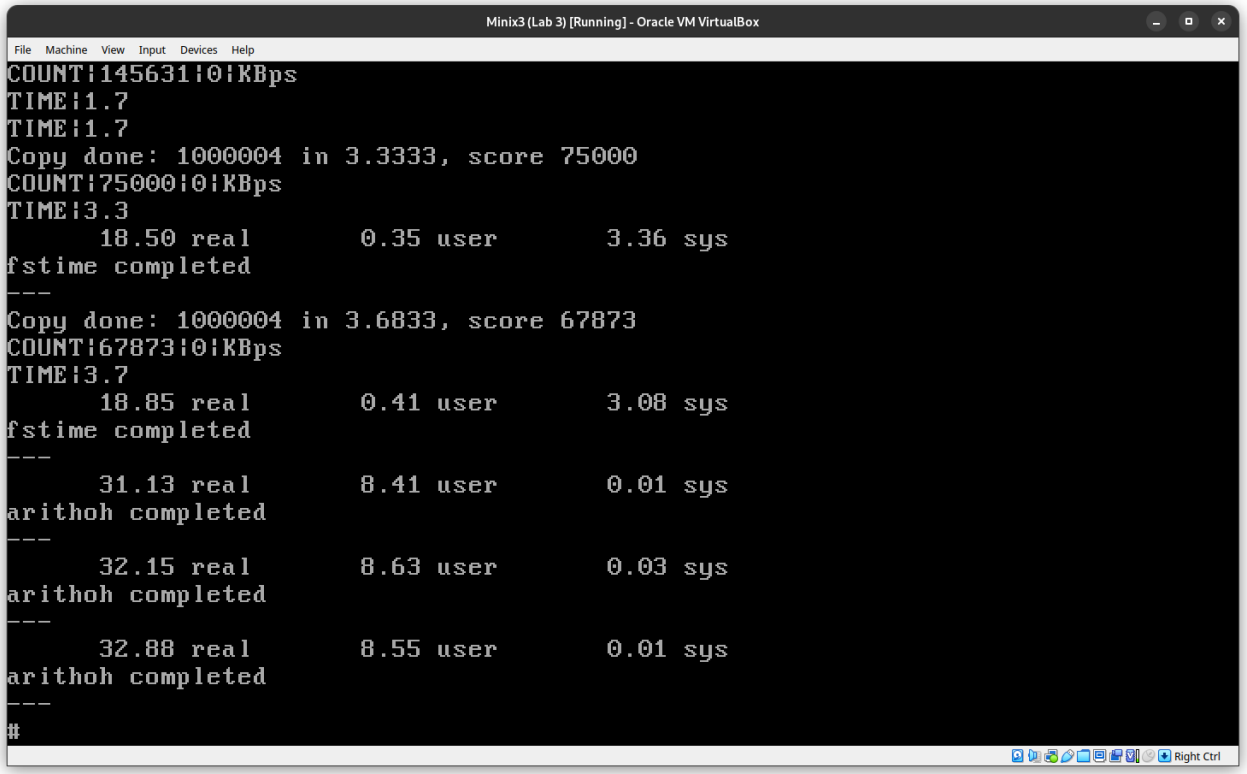
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036): PID 10453 exited (Endpoint 137)
Minix (200010036): PID 10448 exited (Endpoint 132)
Minix (200010036): PID 10443 exited (Endpoint 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
```

```
Minix (200010036): PID 10455 exited (Endpoint 139)
Minix (200010036): PID 10450 exited (Endpoint 134)
Minix (200010036): PID 10445 exited (Endpoint 129)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036): PID 10457 exited (Endpoint 141)
Minix (200010036): PID 10452 exited (Endpoint 136)
Minix (200010036): PID 10447 exited (Endpoint 131)
Minix (200010036): PID 10442 exited (Endpoint 126)
```



workload_mix4.sh:

The workload is as follows:

```
#!/bin/sh
./arithoh.sh &
./arithoh.sh &
./fstime.sh &
./fstime.sh &
./hanoi.sh &
wait
```

In this workload, we consider arithoh, hanoi and fstime processes, the first two of which are CPU bound processes and the third one is an I/O bound process. All these processes are given 200 quanta out of which arithoh and hanoi consume entire 200 quanta, but the fstime takes less quanta depending on whether if it waiting for I/O process (read or write). Here too the processes in all queues run in round robin fashion.

```
Minix (200010036): PID 10459 created (Endpoint: 145)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 145)
Minix (200010036): PID 10460 created (Endpoint: 146)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 146)
Minix (200010036): PID 10461 created (Endpoint: 147)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
Minix (200010036): PID 10462 created (Endpoint: 150)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 150)
Minix (200010036): PID 10463 created (Endpoint: 151)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 151)
Minix (200010036): PID 10464 created (Endpoint: 153)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 153)
Minix (200010036): PID 10465 created (Endpoint: 155)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 155)
Minix (200010036): PID 10466 created (Endpoint: 156)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 156)
Minix (200010036): PID 10467 created (Endpoint: 157)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 157)
Minix (200010036): PID 10468 created (Endpoint: 158)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 158)
Minix (200010036): PID 10469 created (Endpoint: 159)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 159)
Minix (200010036): PID 10470 created (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036): PID 10471 created (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036): PID 10472 created (Endpoint: 162)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 162)
Minix (200010036): PID 10473 created (Endpoint: 163)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 163)
Minix (200010036): PID 10474 created (Endpoint: 164)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 164)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 164)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 164)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 164)
```

```
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 158 / 200 quantum used (Endpoint: 164)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 164)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 145 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 164)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 164)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 164)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 344 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 164)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
```

```
Minix (200010036): PID 10474 exited (Endpoint 164)
Minix (200010036): PID 10469 exited (Endpoint 159)
Minix (200010036): PID 10464 exited (Endpoint 153)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 4 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 163)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 162)
Minix (200010036): PID 10472 exited (Endpoint 162)
Minix (200010036): PID 10467 exited (Endpoint 157)
Minix (200010036): PID 10462 exited (Endpoint 150)
Minix (200010036): PID 10473 exited (Endpoint 163)
Minix (200010036): PID 10468 exited (Endpoint 158)
Minix (200010036): PID 10463 exited (Endpoint 151)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 401 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 187 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
```

```
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
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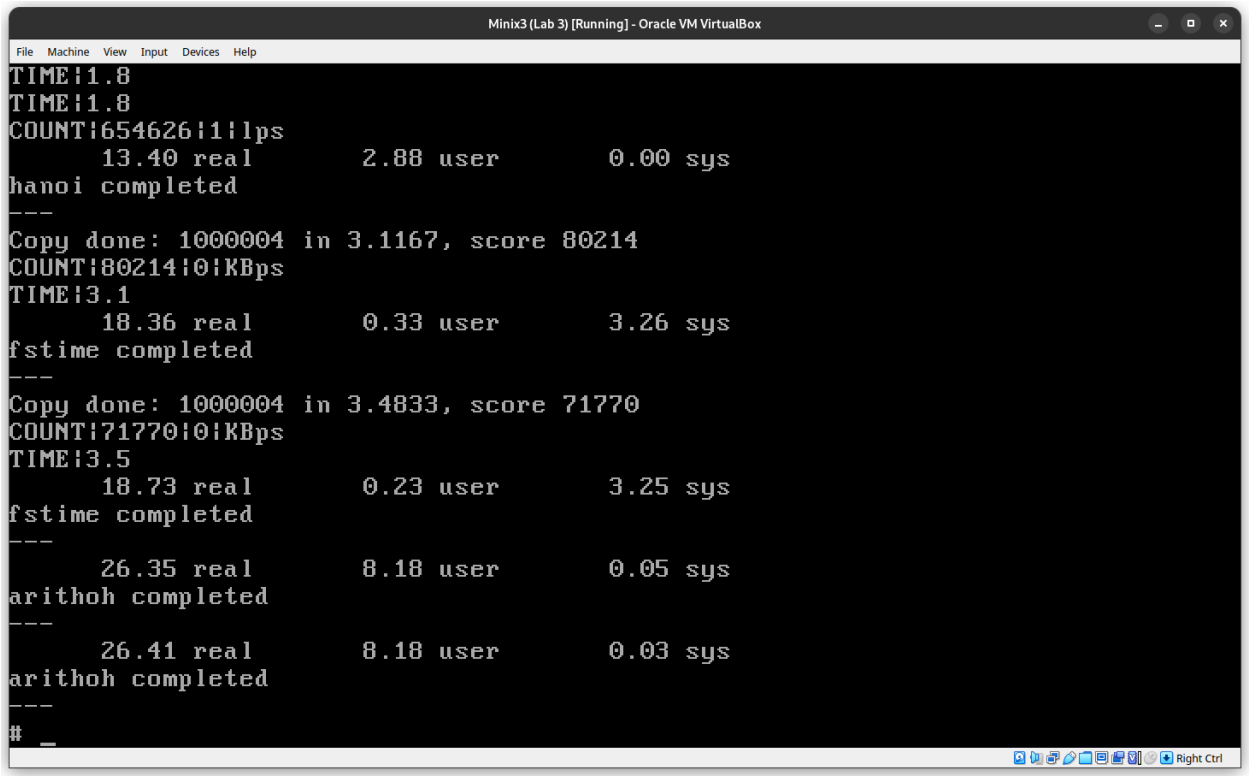
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 160)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036): PID 10470 exited (Endpoint 160)
Minix (200010036): PID 10465 exited (Endpoint 155)
Minix (200010036): PID 10460 exited (Endpoint 146)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 161)
Minix (200010036): PID 10471 exited (Endpoint 161)
Minix (200010036): PID 10466 exited (Endpoint 156)
Minix (200010036): PID 10461 exited (Endpoint 147)
Minix (200010036): PID 10459 exited (Endpoint 145)
```



Part 2

To implement a “Pseudo-FIFO” policy in the scheduler we made the following changes in minix/servers/sched/schedule.c,

In function `do_noquantum()` we replaced

```
if (rmp->priority < MIN_USER_Q) {
      rmp->priority += 1; /* lower priority */
}
```

with

```
if (rmp->priority > rmp->max_priority) {
      rmp->priority -= 1; /* increase priority */
}
```

This causes older processes to have higher priorities giving a FIFO like behaviour. The condition is also changed to ensure that the priority does not exceed the maximum possible priority for the process.

We also in `balanced_queues()` changed

```
rmp->priority -= 1; /* increase priority */
```

with

```
// rmp->priority -= 1; /* increase priority */
```

This is to prevent the periodic boosting of priority of older jobs

Why is this the best implementation?

In our implementation of the Pseudo FIFO, the processes are prioritized on the basis of their time of inception into the ready queue. The processes which come early are put into higher priority queue, and as time passes, they are increased in priority. Hence, as the processes are executed according to the priority of the queues with preference to older processes, this scheduler follows pseudo FIFO.

workload_mix1.sh:

In this workload, we consider the CPU bound process (hanoi.c) which is run 5 times. Since we are using a pseudo FIFO policy, the scheduler first schedules the first hanoi process, which runs for 200 quanta. After this, the next hanoi is scheduled for 200 quanta and so on. This leads to all these processes to be scheduled using the FIFO scheme according to their order of entering the ready queue.

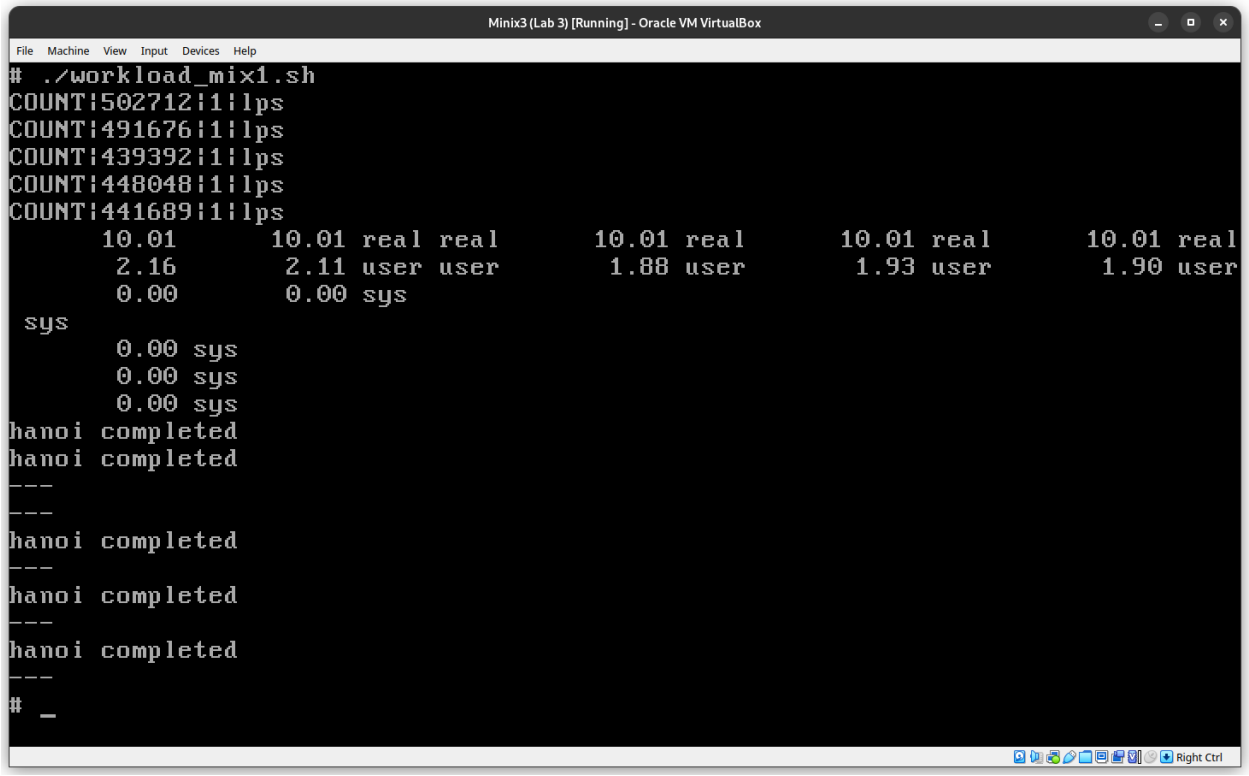
```
Minix (200010036): PID 26755 created (Endpoint: 175)
(200010036) Minix: PID 8945839 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 175)
Minix (200010036): PID 26756 created (Endpoint: 176)
(200010036) Minix: PID 8847536 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 176)
Minix (200010036): PID 26757 created (Endpoint: 177)
(200010036) Minix: PID 8454321 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 177)
Minix (200010036): PID 26758 created (Endpoint: 178)
(200010036) Minix: PID 8519858 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 178)
Minix (200010036): PID 26759 created (Endpoint: 179)
(200010036) Minix: PID 8028339 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 179)
Minix (200010036): PID 26760 created (Endpoint: 180)
(200010036) Minix: PID 8061108 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 180)
Minix (200010036): PID 26761 created (Endpoint: 181)
(200010036) Minix: PID 8978613 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 181)
Minix (200010036): PID 26762 created (Endpoint: 182)
(200010036) Minix: PID 8945846 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 182)
Minix (200010036): PID 26763 created (Endpoint: 183)
```

```
(200010036) Minix: PID 8945847 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 183)
Minix (200010036): PID 26764 created (Endpoint: 184)
(200010036) Minix: PID 8978616 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 184)
Minix (200010036): PID 26765 created (Endpoint: 185)
(200010036) Minix: PID 8978617 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 185)
Minix (200010036): PID 26766 created (Endpoint: 186)
(200010036) Minix: PID 8978618 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 186)
Minix (200010036): PID 26767 created (Endpoint: 187)
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 187)
Minix (200010036): PID 26768 created (Endpoint: 188)
(200010036) Minix: PID 8978620 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 188)
Minix (200010036): PID 26769 created (Endpoint: 189)
(200010036) Minix: PID 8782013 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 189)
Minix (200010036): PID 26770 created (Endpoint: 195)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978618 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 186)
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 187)
(200010036) Minix: PID 8978620 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 188)
(200010036) Minix: PID 8782013 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 189)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978618 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 186)
(200010036) Minix: PID 8978620 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 188)
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 187)
(200010036) Minix: PID 8782013 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 189)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978620 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 188)
```

```
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 187)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978618 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 186)
(200010036) Minix: PID 8782013 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 189)
(200010036) Minix: PID 8978620 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 188)
(200010036) Minix: PID 8978618 swapped in
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 186)
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 132 / 200 quantum used (Endpoint: 187)
(200010036) Minix: PID 8978620 swapped in
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 188)
(200010036) Minix: PID 8782013 swapped in
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 189)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 187)
(200010036) Minix: PID 8978618 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 186)
(200010036) Minix: PID 8782013 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 189)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 187)
(200010036) Minix: PID 8978618 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 186)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978620 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 188)
(200010036) Minix: PID 8782013 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 189)
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 187)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978620 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 188)
(200010036) Minix: PID 8978618 swapped in
```

```
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 186)
(200010036) Minix: PID 8782013 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 189)
(200010036) Minix: PID 8782013 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 189)
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 187)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978620 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 188)
(200010036) Minix: PID 8978618 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 186)
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 187)
(200010036) Minix: PID 8978618 swapped in
Minix (200010036/37): 170 / 200 quantum used (Endpoint: 186)
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 0 / 200 quantum used (Endpoint: 187)
(200010036) Minix: PID 8978620 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 188)
(200010036) Minix: PID 8782013 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 189)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978618 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 186)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978620 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 188)
(200010036) Minix: PID 8782013 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 189)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8978618 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 186)
(200010036) Minix: PID 8978619 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 187)
Minix (200010037): PID 26768 exited (Endpoint 188)
Minix (200010037): PID 26763 exited (Endpoint 183)
Minix (200010037): PID 26758 exited (Endpoint 178)
Minix (200010037): PID 26769 exited (Endpoint 189)
Minix (200010037): PID 26764 exited (Endpoint 184)
Minix (200010037): PID 26759 exited (Endpoint 179)
```

```
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
Minix (200010037): PID 26766 exited (Endpoint 186)
Minix (200010037): PID 26761 exited (Endpoint 181)
Minix (200010037): PID 26756 exited (Endpoint 176)
Minix (200010037): PID 26767 exited (Endpoint 187)
Minix (200010037): PID 26762 exited (Endpoint 182)
Minix (200010037): PID 26757 exited (Endpoint 177)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
(200010036) Minix: PID 8782019 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 195)
Minix (200010037): PID 26770 exited (Endpoint 195)
Minix (200010037): PID 26765 exited (Endpoint 185)
Minix (200010037): PID 26760 exited (Endpoint 180)
Minix (200010037): PID 26755 exited (Endpoint 175)
Minix (200010036): PID 26771 created (Endpoint: 196)
(200010036) Minix: PID 8978628 swapped in
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 196)
```



workload_mix2.sh:

In this workload, we have run 5 fstime processes. These processes are run in the FIFO scheduling scheme. Hence, according to the FIFO scheme, the first fstime is scheduled first. When this fstime is blocked due to an I/O event, the scheduler waits for it to complete the I/O event and return to its CPU activity. Once this process is completed, it executes the next processes and so on. This leads to starvation of the subsequent I/O processes, which turnaround time and response time is very high.

```
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26774 created
(Endpoint: 199)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8978631 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 199)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26775 created
(Endpoint: 200)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8978632 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 200)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26776 created
(Endpoint: 201)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8978633 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 201)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26777 created
(Endpoint: 202)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8978634 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 202)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26778 created
(Endpoint: 203)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8978635 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 203)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26779 created
(Endpoint: 204)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8945868 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 204)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26780 created
(Endpoint: 205)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8782029 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 205)
```

```
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26781 created
(Endpoint: 206)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8618190 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 206)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26782 created
(Endpoint: 207)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8782031 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 207)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26783 created
(Endpoint: 208)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8978640 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 208)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26784 created
(Endpoint: 209)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8913105 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 209)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26785 created
(Endpoint: 210)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8913106 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 210)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26786 created
(Endpoint: 211)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8978643 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 211)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26787 created
(Endpoint: 212)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8782036 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 212)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26788 created
(Endpoint: 213)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8782037 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 213)
Feb  5 21:17:50 10 kernel: Minix (200010036): PID 26789 created
(Endpoint: 214)
Feb  5 21:17:50 10 kernel: (200010036) Minix: PID 8913110 swapped in
Feb  5 21:17:50 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 214)
```

```
Feb  5 21:17:54 10 kernel: Minix (200010036): PID 26790 created
(Endpoint: 215)
Feb  5 21:17:54 10 kernel: (200010036) Minix: PID 8814807 swapped in
Feb  5 21:17:54 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 215)
Feb  5 21:17:54 10 kernel: Minix (200010037): PID 26790 exited
(Endpoint 215)
Feb  5 21:17:55 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:17:55 10 kernel: Minix (200010036/37): 500 / 500 quantum
used (Endpoint: 24)
Feb  5 21:17:57 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:17:57 10 kernel: Minix (200010036/37): 500 / 500 quantum
used (Endpoint: 24)
Feb  5 21:17:59 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:17:59 10 kernel: Minix (200010036/37): 92 / 500 quantum used
(Endpoint: 24)
Feb  5 21:18:00 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:00 10 kernel: Minix (200010036/37): 500 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:03 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:03 10 kernel: Minix (200010036/37): 127 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:07 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:07 10 kernel: Minix (200010036/37): 500 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:08 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:08 10 kernel: Minix (200010036/37): 195 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:10 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:10 10 kernel: Minix (200010036/37): 500 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:13 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:13 10 kernel: Minix (200010036/37): 154 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:15 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:15 10 kernel: Minix (200010036/37): 500 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:17 10 kernel: (200010036) Minix: PID 8913110 swapped in
Feb  5 21:18:17 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 214)
Feb  5 21:18:17 10 kernel: (200010036) Minix: PID 8782037 swapped in
Feb  5 21:18:17 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 213)
Feb  5 21:18:18 10 kernel: (200010036) Minix: PID 65560 swapped in
```

```
Feb  5 21:18:18 10 kernel: Minix (200010036/37): 449 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:18 10 kernel: (200010036) Minix: PID 8782037 swapped in
Feb  5 21:18:18 10 kernel: Minix (200010036/37): 0 / 200 quantum used
(Endpoint: 213)
Feb  5 21:18:18 10 kernel: (200010036) Minix: PID 8913110 swapped in
Feb  5 21:18:18 10 kernel: Minix (200010036/37): 0 / 200 quantum used
(Endpoint: 214)
Feb  5 21:18:18 10 kernel: (200010036) Minix: PID 8782036 swapped in
Feb  5 21:18:18 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 212)
Feb  5 21:18:18 10 kernel: (200010036) Minix: PID 8913106 swapped in
Feb  5 21:18:18 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 210)
Feb  5 21:18:18 10 kernel: (200010036) Minix: PID 8978643 swapped in
Feb  5 21:18:18 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 211)
Feb  5 21:18:20 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:20 10 kernel: Minix (200010036/37): 500 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:22 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:22 10 kernel: Minix (200010036/37): 500 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:22 10 kernel: Minix (200010037): PID 26788 exited
(Endpoint 213)
Feb  5 21:18:22 10 kernel: Minix (200010037): PID 26783 exited
(Endpoint 208)
Feb  5 21:18:22 10 kernel: Minix (200010037): PID 26778 exited
(Endpoint 203)
Feb  5 21:18:22 10 kernel: Minix (200010037): PID 26789 exited
(Endpoint 214)
Feb  5 21:18:22 10 kernel: Minix (200010037): PID 26784 exited
(Endpoint 209)
Feb  5 21:18:22 10 kernel: Minix (200010037): PID 26779 exited
(Endpoint 204)
Feb  5 21:18:23 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:23 10 kernel: Minix (200010036/37): 130 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:23 10 kernel: (200010036) Minix: PID 8913106 swapped in
Feb  5 21:18:23 10 kernel: Minix (200010036/37): 9 / 200 quantum used
(Endpoint: 210)
Feb  5 21:18:23 10 kernel: (200010036) Minix: PID 8978643 swapped in
Feb  5 21:18:23 10 kernel: Minix (200010036/37): 10 / 200 quantum used
(Endpoint: 211)
Feb  5 21:18:23 10 kernel: (200010036) Minix: PID 8782036 swapped in
```

```
Feb  5 21:18:23 10 kernel: Minix (200010036/37): 10 / 200 quantum used
(Endpoint: 212)
Feb  5 21:18:25 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:25 10 kernel: Minix (200010036/37): 500 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:26 10 kernel: (200010036) Minix: PID 65564 swapped in
Feb  5 21:18:26 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 28)
Feb  5 21:18:29 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:29 10 kernel: Minix (200010036/37): 326 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:29 10 kernel: (200010036) Minix: PID 65564 swapped in
Feb  5 21:18:29 10 kernel: Minix (200010036/37): 0 / 200 quantum used
(Endpoint: 28)
Feb  5 21:18:29 10 kernel: Minix (200010037): PID 26786 exited
(Endpoint 211)
Feb  5 21:18:29 10 kernel: Minix (200010037): PID 26781 exited
(Endpoint 206)
Feb  5 21:18:29 10 kernel: Minix (200010037): PID 26776 exited
(Endpoint 201)
Feb  5 21:18:29 10 kernel: Minix (200010037): PID 26785 exited
(Endpoint 210)
Feb  5 21:18:29 10 kernel: Minix (200010037): PID 26780 exited
(Endpoint 205)
Feb  5 21:18:29 10 kernel: Minix (200010037): PID 26775 exited
(Endpoint 200)
Feb  5 21:18:29 10 kernel: Minix (200010037): PID 26787 exited
(Endpoint 212)
Feb  5 21:18:29 10 kernel: Minix (200010037): PID 26782 exited
(Endpoint 207)
Feb  5 21:18:29 10 kernel: Minix (200010037): PID 26777 exited
(Endpoint 202)
Feb  5 21:18:29 10 kernel: Minix (200010037): PID 26774 exited
(Endpoint 199)
Feb  5 21:18:33 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:33 10 kernel: Minix (200010036/37): 354 / 500 quantum
used (Endpoint: 24)
Feb  5 21:18:38 10 kernel: (200010036) Minix: PID 65560 swapped in
Feb  5 21:18:38 10 kernel: Minix (200010036/37): 1 / 500 quantum used
(Endpoint: 24)
Feb  5 21:18:43 10 kernel: Minix (200010036): PID 26791 created
(Endpoint: 216)
Feb  5 21:18:43 10 kernel: (200010036) Minix: PID 8814808 swapped in
Feb  5 21:18:43 10 kernel: Minix (200010036/37): 200 / 200 quantum
used (Endpoint: 216)
```

workload_mix3.sh:

In this workload, we alternately run the arithoh and fstime processes. Here first the arithoh process is scheduled and is completed. Then, the fstime is scheduled. This process gets blocked for I/O event and the scheduler waits for it to return from I/O. So, the starvation of the processes is caused mostly due to the I/O bound process fstime in this case, since the arithoh does not make any I/O calls and completes its execution without waiting for an I/O event.

```
Minix (200010036): PID 366 created (Endpoint: 116)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 116)
Minix (200010036): PID 367 created (Endpoint: 117)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 117)
Minix (200010036): PID 368 created (Endpoint: 118)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 118)
Minix (200010036): PID 369 created (Endpoint: 119)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 119)
Minix (200010036): PID 370 created (Endpoint: 120)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 120)
Minix (200010036): PID 371 created (Endpoint: 121)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 121)
Minix (200010036): PID 372 created (Endpoint: 122)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 122)
```

```
Minix (200010036): PID 373 created (Endpoint: 123)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 123)
Minix (200010036): PID 374 created (Endpoint: 124)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 124)
Minix (200010036): PID 375 created (Endpoint: 125)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 125)
Minix (200010036): PID 376 created (Endpoint: 126)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 126)
Minix (200010036): PID 377 created (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036): PID 378 created (Endpoint: 128)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 128)
Minix (200010036): PID 379 created (Endpoint: 129)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 129)
Minix (200010036): PID 380 created (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036): PID 381 created (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
```

```
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
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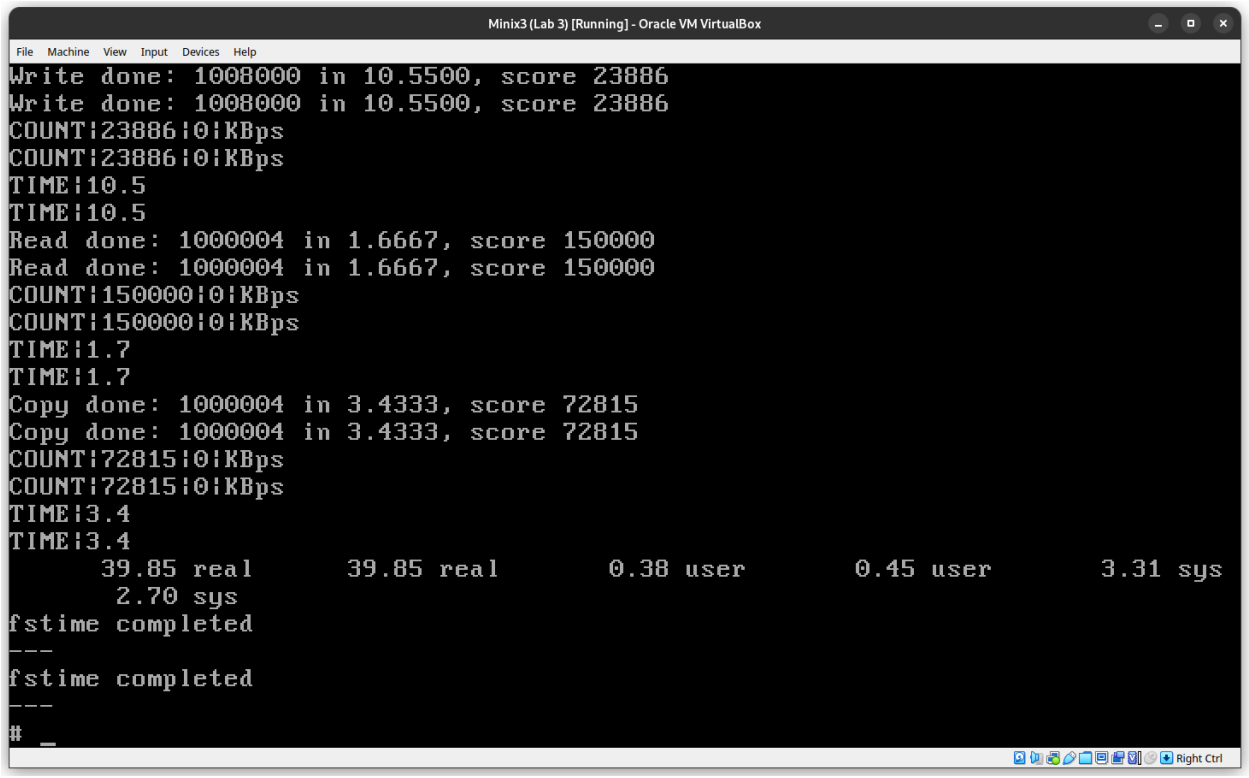
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)

```
Minix (200010036): PID 381 exited (Endpoint 131)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 130)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 127)
Minix (200010036): PID 380 exited (Endpoint 130)
Minix (200010036): PID 377 exited (Endpoint 127)
Minix (200010036): PID 374 exited (Endpoint 124)
Minix (200010036): PID 376 exited (Endpoint 126)
Minix (200010036): PID 372 exited (Endpoint 122)
Minix (200010036): PID 369 exited (Endpoint 119)
Minix (200010036): PID 371 exited (Endpoint 121)
Minix (200010036): PID 367 exited (Endpoint 117)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 128)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 129)
Minix (200010036): PID 379 exited (Endpoint 129)
Minix (200010036): PID 378 exited (Endpoint 128)
Minix (200010036): PID 373 exited (Endpoint 123)
Minix (200010036): PID 375 exited (Endpoint 125)
Minix (200010036): PID 368 exited (Endpoint 118)
Minix (200010036): PID 370 exited (Endpoint 120)
Minix (200010036): PID 366 exited (Endpoint 116)
```



workload_mix4.sh:

In this workload, we have a mix of arithoh, fstime and hanoi processes. Here again, the processes are scheduled in sequential order. So, first the 2 CPU bound processes (arithoh) are executed one after another. Then the two fstime processes are scheduled, which take some time to run, as they intermittently get blocked due to I/O calls. Then the hanoi process is scheduled, which is a CPU bound process, and gets completed at the last.

```
Minix (200010036): PID 383 created (Endpoint: 133)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 133)
Minix (200010036): PID 384 created (Endpoint: 134)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 134)
Minix (200010036): PID 385 created (Endpoint: 135)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 135)
Minix (200010036): PID 386 created (Endpoint: 136)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 136)
Minix (200010036): PID 387 created (Endpoint: 137)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 137)
Minix (200010036): PID 388 created (Endpoint: 138)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 138)
Minix (200010036): PID 389 created (Endpoint: 139)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 139)
Minix (200010036): PID 390 created (Endpoint: 140)
```

```
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 140)
Minix (200010036): PID 391 created (Endpoint: 141)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 141)
Minix (200010036): PID 392 created (Endpoint: 143)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 143)
Minix (200010036): PID 393 created (Endpoint: 145)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 145)
Minix (200010036): PID 394 created (Endpoint: 146)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 146)
Minix (200010036): PID 395 created (Endpoint: 147)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
Minix (200010036): PID 396 created (Endpoint: 148)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 148)
Minix (200010036): PID 397 created (Endpoint: 150)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 150)
Minix (200010036): PID 398 created (Endpoint: 151)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 151)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 146)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 146)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 146)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 146)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
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Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 146)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 146)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 146)
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Minix (200010036): PID 394 exited (Endpoint 146)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
Minix (200010036): PID 398 exited (Endpoint 151)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 147)
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7): 200 / 200 quantum used (Endpoint: 147)
Minix (200010036): PID 395 exited (Endpoint 147)
Minix (200010036): PID 389 exited (Endpoint 139)
Minix (200010036): PID 393 exited (Endpoint 145)
Minix (200010036): PID 390 exited (Endpoint 140)
Minix (200010036): PID 384 exited (Endpoint 134)
Minix (200010036): PID 388 exited (Endpoint 138)
Minix (200010036): PID 385 exited (Endpoint 135)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 28)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 148)
Minix (200010036/37): 500 / 500 quantum used (Endpoint: 20)
Minix (200010036): PID 396 exited (Endpoint 148)
Minix (200010036): PID 391 exited (Endpoint 141)
Minix (200010036): PID 386 exited (Endpoint 136)
Minix (200010036/37): 200 / 200 quantum used (Endpoint: 150)
Minix (200010036): PID 397 exited (Endpoint 150)
Minix (200010036): PID 392 exited (Endpoint 143)
Minix (200010036): PID 387 exited (Endpoint 137)
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Minix (200010036): PID 383 exited (Endpoint 133)